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Snippets of India's Polar Research

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Abstract- Distant non–Arctic states, non government organisations, international organisations etc. have evinced interest and staked claim for engagement in the Arctic Council and thus Arctic has become a geopolitical, geo-economic issue of great importance in the recent times. India has cited climate change as well as impact and inter-connection between the Arctic climate and Indian monsoons due to the receding ice cover as a basis of its research, thus legitimising its role as an Observer and stakeholder. Despite the huge geographical distances between India and the Poles, it possesses an exceptional alpine region with the Himalayas in its background having polar characteristics to aid polar scientific research.

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I. Introduction

With the continuously changing situation at the North Pole, witnessing record highs of the polar ice sheet melts and the corollary growth in the avenues to exploit the vast untapped hydrocarbon deposits as well as opening up of shorter shipping routes to commercial and lucrative development, the Arctic region is garnering attention of the global comity of nations including India, who are vying for a say and place in Arctic affairs.

Other than the Arctic Council members and littoral states, distant non –Arctic states, non government organisations, international organisations etc. have evinced interest and staked claim for engagement and thus Arctic has become a geopolitical, geo-economic issue of great importance in the recent times. India has cited climate change as well as impact and inter-connection between the Arctic climate and Indian monsoons due to the receding ice cover as a basis of its research, thus legitimising its role as an Observer and stakeholder. Despite the huge geographical distances between India and the Poles, it possesses an exceptional alpine region with the Himalayas in its background having polar characteristics to aid polar scientific research.

This paper tries to comment on India's scientific focus though the author acknowledges the lack of any formal education in science and has relied solely on National Centre for Polar and Ocean Research's (NCPOR) Annual reports and other inputs available in public domain. Some data has been analysed from a lay-man's perspective and the author is blameworthy for any wrongful extrapolation.

II. Research Focus

Unlike the Arctic-8 countries namely Canada, Denmark, Finland, Russia, the USA, Sweden, Norway and Iceland, India does not have permanent research station/facilities within or close to the Arctic Circle. The town of Ny-Ålesund, Norway is being used as the international research base by Norway, France, Germany, Italy, the Netherlands, the UK, India, China, Japan, and Korea which have established research stations and conduct research from there. India had commenced its research presence in Arctic since 2007 and established its research station Himadri in 2008. Among the Asian countries, India lagged behind China, Japan and Korea in commencing its research at Arctic but on the other hand, it has the advantage of having the Himalayas as the third largest depository of ice outside of the Poles in its backyard. Considering that India mans its Arctic research station only between April to September every year and exacerbated by the huge distances and transportation costs involved, there are huge deficits in the output, depth and quality of Indian polar scientific research.

India's Ministry of Earth Sciences (MoES) and its executive arm, Earth System Science Organisation (ESSO) and National Centre for Polar and Ocean Research (NCPOR) was constituted to understand and address the various aspects relating to earth processes for understanding the variability of earth system and for improving forecast of the weather, climate and hazards. The MoES has acknowledged that the Himalayas store the greatest concentration of snow apart from the Poles. The Himalaya range encompasses enormous variation in elevation, precipitation, biodiversity, and patterns of human livelihoods. (Singh., S.P and Thadani., Rajesh, 2015). The Ministry of Earth Sciences has been reiterating that its research activities are being focused at the Poles and the Himalayas. Indian research activities of the Cryosphere are concentrated in three major regions: (1) Antarctic region (2) Arctic region and (3) Himalayan region. (Ministry of Earth Sciences, 2011). In order to obtain more comprehensive understanding of climate change, it is also required to have climate records from Arctic region and Himalayas in addition to the Antarctica. (Ministry of Earth Sciences, 2011). The stated objective of Indian research also incorporates the study of the biogeochemical aspects of Himalayan ice and compare it with the polar environment. (Ministry of Earth Sciences, 2011).

It is universally acknowledged that the Tibetan plateau and the Himalayas exert a great influence on the regional and global climate due to their unique topography and affect the global atmosphere and fresh water flow on a massive scale. Moreover, there is extreme diversity and variation prevailing in the

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Himalaya region in terms of forest cover, rainfall and biodiversity and a standard template cannot be applied. However, based on a cursory survey of NCPOR's seven Annual reports from 2012-13 to 2018-19 it appears that India has not devoted commensurate effort towards studying the Himalayas and its inter-linkages with the Polar environment. Indian research is also found deficient in studying the oft-quoted tele-connections between the Indian monsoons and Arctic snow recession. As per the Ministry of External Affairs (MEA) it was stated that the objective of Indian research included the study the hypothesized tele-connections between the Arctic climate and the Indian monsoon by analyzing the sediment and ice core records from the Arctic glaciers and the Arctic Ocean. (Ministry of External Affairs, 2013). Though India's research stations are located at both the poles, there are negligible attempts at co-relation of the data of the Poles among each other as well as with that of Himalayas.

It has been acknowledged by the MoES that there are over 9500 glaciers in the Himalayas, yet only symbolic study of the Himalayan Cryosphere is being undertaken. The detailed glacier inventory of Indian Himalayas (GSI, SAC) indicates presence of 9579 glaciers in the Himalaya, some of which form the perennial source of major rivers. (Ministry of Earth Sciences, 2011).

As a developing country with agriculture as the mainstay for majority of its population, the climatic impacts of a warming planet leading to disruption in yields should be the focal point of Indian research. Glacier retreat and snow cover changes have contributed to localized declines in agricultural yields in some high mountain regions, including Hindu Kush Himalaya and the tropical Andes . (IPCC, 2019). Against the presence of various glaciers spread over great distances with varying ecological parameters as well as similar features available in neighbouring countries in the Himalayan region for study of mountain weather phenomena, environmental, biogeochemical and ecosystem variabilities, the studies on the same appear not to have been undertaken. Yet, against the huge and humongous data available, India is assessed to be undertaking mere superficial studies, data for most of which has been already documented and researched. Instead of carrying out research in novel and unexplored areas, India appears to be relying on historical data points. The MoES has acknowledged that it is conducting studies by 'Identification of a few type glaciers such as Chota Sigri, Hamta and others for which *some previous glaciological data are available,* for detailed glacial assessment and mass balance studies.' (Ministry of Earth Sciences, 2011).

In the Himalayas, a pilot expedition to the Batal and the Sutri Dhaka glaciers in Himachal Pradesh was undertaken by a five-member team during August – September 2013, as a prelude to the initiation of a major long-term program of cryosphere studies in the Himalaya. The team, during its month-long expedition, established a network of stakes on the glaciers to collect data for mass balance studies. (MoES Annual Report 2013-14).

Based on the aforesaid, two issues stand out that firstly India appears to be focussing only on those glaciers for which preliminary data is already available and secondly the pace of research appears to be tardy. From a lay-man's viewpoint, expeditions marked by its duration (one month) should not be the parameter, especially during the inception stages of any project.

A systematic long-term scientific investigation of Himalayan glaciers with objective "to understand the response of Himalayan Cryosphere to the changing climate and its hydrological impacts" has been carried out. Six selected benchmark glaciers (Sutri Dhaka, Batal, Bara Shigri, Samudra Tapu, Gepang and Kunzam) of Chandra basin, western Himalaya have been monitored for their changes. (MoES Annual Report 2019-20).

Despite commencing research at Arctic in 2007, the MoES has also acknowledged that 'systematic studies if (of) the cryospheric domain of the Arctic is as yet to be initiated.' (Ministry of Earth Sciences, 2011).

Figure 1 placed below depicts the number of papers on various subjects based on data contained in the NCPOR's seven Annual reports from 2012-13 to 2018-19 which shows that Himalayas has been covered mere *5.65%* (25/442*100) which appears to be grossly inadequate. The papers on Himalayas are placed in Table 1. A connected issue is that there is no data available on overnight stay by the ESSO scientists near Himalayas which could have given more clarity on the research efforts. In short, the Himalayas which possess many similarities with the Poles have been little studied and thus less understood. Since the Himalayas are water towers for nearly one-sixth of the human population including India, the scientific efforts to understand and co-relate with the climate change should form the bulwark of research efforts.

Figure 1: Subject wise papers as per data in NCPOR Annual Reports (2012-13 to 2018-19)

Table 1: Papers on Himalayas in NCPOR Annual Reports (2012-13 to 2018-19)

a) Duplication

A worrying issue noticed by perusing the NCPOR's Annual reports is the fact that previously published papers have been duplicated on several occasions. With NCPOR scientists having sole access to the data obtained from sensors and equipment installed by the Government of India in Polar, Ocean and Himalayan regions the prevalence of duplication is a

dent in having reliable, insightful and ethical research. Since NCPOR is the sole and pioneer institution heralding polar as well as ocean research, this duplication can be attributed to one of the following two reasons. It is assessed that the main reason for such duplication is to enhance the number of publications so as to give volume and credibility to the research. It is brought out that one paper from Fridtjof Nansens Institutt in 2013 had commented that 'Looking at India's research activities in terms of publication output the annual numbers have been modest.(Stensdal, 2013). The other reason for duplication could be to embellish the authors' curriculum vitae.

Though the author is ill-equipped and unqualified to comment on the co-relation/ similarity between the subjects, yet as per the Table 2 placed below, it is seen that the duplicated papers stand at *6.33%*. Some other instances of similar papers are placed at Table 3, which have been tabulated from a lay-person's perspective and specialists from the subject can offer elaborate comments.

It is recommended that there must be stringent evaluation of the stream of publications from a researcher/subject utilising the same data and same theory and thus avoid duplication. The practice of thorough review of all scientific literature on the subject, formulation of the idea/objective of the research and designation of the subject part of the research along with a self-declaration by the researcher are few tools that can cease such blatant publishing violations. The ethics and methodology of utilising the data obtained from government sensors/equipment deployed at various locations is a separate study in itself and is being skipped here.

Table 2: Few Instances of Duplication of papers in NCPOR Annual Reports (2012-13 to 2018-19)

Table 3: Few instances of papers on similar/same subject in NCPOR Annual Reports (2012-13 to 2018-19)

b) Papers on Health

Another feature on visits by Indian researchers as part of Indian expeditions to the Antarctic and Arctic shows that the duration of visit of individual scientists remains close to one month, generally. Considering the long distances involved, need for acclimatisation and other logistics requirements, it is recommended that such short duration visits could be substituted by longer durations for greater productivity.

Though the duration of stay of NCPOR personnel at Antarctica is not given out in Annual Reports 2010-11 yet three papers put in the NCPOR Annual Report 2012-13 with the under-mentioned titles imply that the stay in Antarctic was for one year. This fact is neither corroborated by the data in the particular year's annual reports nor the prevailing precedents of Indian expeditions. The particular papers are:-

i. Obesity, dyslipidemia and cholesterol gallstone disease during *one year of* Antarctic residence. (Ser No. 10 NCPOR Annual Report 2012-13)
ii. Circadian melatonin and cortisol levels in relation to depression, sleep and neurocognitive performance over *one year of* Antarctic residence. (Ser No. 11 NCPOR Annual Report 2012-13)
iii. Vitamin D homeostasis, bone mineral metabolism and seasonal affective disorder during *one year of* Antarctic residence. (Ser No. 12 NCPOR Annual Report 2012-13)

The contention is also shaken by another paper titled 'Psychological Health in the summer team of an Indian expedition to Antarctica' (Ser No. 18 NCPOR Annual Report 2015-16) and the particulars of duration of Indian Expeditions to Antarctic given in Table 4, which also affirms that Indian expeditions are launched during the Antarctic summer months and not once in any NCPOR annual report, year long residence is given out.

Table 4: Duration of Indian Expedition to Antarctic (2012-13 to 2018-19)

It seems that these papers may be based on data falsification and NCPOR must subject its papers to Retraction Watch Database and other similar tools for credible output. Off late, there has been a flurry of retraction of scientific papers on grounds of plagiarism and image duplication. 'While 127 papers retracted might be a fraction of the number of papers published each year from India, it is still a huge number considering how reluctant journal publishers are in retraction' (The Hindu, 2019). The purpose as well as credibility of NCPOR to function as an authentic, reliable repository is shaken by the aforesaid instances and a corrigendum may well serve to keep its scientific integrity intact.

c) Attendance of Commission on the limits of Continental shelf (CLCS) Meetings

On perusal of NCPOR Annual reports, it is also seen that India has been deputing scientists to attend the CLCS meetings rather than sending experts on legal/technical issues, as is the practice by all important countries. A brief on the United Nations Commission on the limits of Continental shelf is given below. As per the List of experts for the purposes of article 2 of Annex VIII (Special Arbitration) to the Convention (UN.org, 2020), India does not have any experts in the following three fields:-

i. List of experts in the field of fisheries maintained by the Food and Agriculture Organization of the United Nations (communicated on 12 January 2017) (https://www.un.org/Depts/los/settlement_of_disputes/experts_special_arb.htm)
ii. List of experts in the field of marine scientific research maintained by the Intergovernmental

Oceanographic Commission of UNESCO (as at 28 January 2016) (https://www.un.org/Depts/los/settlement_of_disputes/experts_special_arb.htm)

iii. List of experts in the field of navigation, including pollution from vessels and by dumping, maintained by the International Maritime Organization (as at 8 April 2019) (https://www.un.org/Depts/los/settlement_of_disputes/experts_special_arb.htm)

Also, none of the six experts named by India in the field of protection and preservation of the marine environment maintained by the United Nations Environment Programme (communicated on 8 November 2002) is from NCPOR. (https://www.un.org/Depts/los/settlement_of_disputes/experts_special_arb.htm)

The origin of the term Continental Shelf is exclusively based on its geomorphologic concept. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) is one of the most important accomplishments in the development of international law in the twentieth century.

Despite the fact that there is a (L & T) Legal and Treaty division at MEA, (https://www.mea.gov.in/divisions.htm) it is seen that instead of sending domain experts, India has been sending diverse personnel including NCPOR scientists for CLCS meetings, in which the sovereign's claims on maritime boundaries are at stake.

The presentation of the submission to the Commission was made on 16 August 2010 by Shailesh Nayak, Secretary, Ministry of Earth Sciences, head of delegation, Anil Kumar Chaubey, Scientist, National Institute of Oceanography, and Narinder Singh, Joint Secretary and Legal Adviser, Ministry of External Affairs. The delegation of India also included Manjeev Singh Puri, Deputy Permanent Representative of India to the United Nations, and a number of advisers. (https://undocs.org/en/clcs/68).

It is vital to point out that notes verbales had been submitted to the UN CLCS by Myanmar on 04 August 2009, Bangladesh on 29 October 2009 and Oman on 19 May 2010 regarding delimitation of maritime boundaries with India. However, till September 2019 India was yet to enter into agreements with the Eastern offshore neighbours and thus the issue remains suspended. In conformity with the decision taken at its twenty-sixth session (CLCS/68, paras35–36), and in the absence of communications conveying developments in this regard, the Commission instructed the subcommission to examine the information submitted in respect of the western offshore region of India in the Arabian Sea and not to consider the part of the submission relating to the eastern offshore region of India, comprising the eastern offshore region of mainland India in the Bay of Bengal and the western offshore region of the Andaman Islands. (https://undocs.org/en/clcs/50/2). Thus India's maritime limitation issue in its Eastern offshore remains unfinished and unresolved.

Maritime legislation and marine legal order along with global ocean governance is a separate field and requires constant and updated domain expertise. A corollary to this is found in attuning domestic laws and legislation to UNCLOS. Another connected feature is participation in the other two exclusive bodies set up under UNCLOS namely International Seabed Authority, International Tribunal for the Law of the Sea. Based on information compiled from NCPOR Annual reports at Table 5 placed below, it is clear that diverse personnel as well as persons not acquainted with the domain knowledge are being sent for maritime legislation and legal order related work which may not do justice to the expertise required.

Table 5: NCPOR personnel on CLCS meetings/ maritime delimitation

III. Conclusion

India can derive parallels between its Antarctic expedition's scientific expertise and legacy as also as the state having the Third Pole, the Himalayas in its backyard to boast its credentials. India can put forward the Arctic governance example to build trust and foster intergovernmental cooperation to bring together India, China, Nepal, Pakistan, Bhutan, Afghanistan, and also Myanmar and Bangladesh among nations that are impacted by the developments in the Himalayan-Third Pole region. It is prudent that India's neighbours be coopted in a broad strategy so that no only India's position is strengthened but the resources are not monopolized by certain countries alone. It will pay handsome dividends to assume support of Asian partners and assume a lead position in sustained deliberations to obtain a lucrative and mutually beneficial arrangement. Among the Asian nations, India and China have been enriched by the observer status in the AC and can bring forth the insight and experience for the region's benefit. However, the dimension of the Third Pole remains conceptual and India has not been able to integrate this into the broad arctic discourse. China meanwhile has started the 'Third Pole Environment' (TPE) programme (Located at the Chinese Academy of Science in Beijing, TPE programme is pursued by the Institute of Tibetan Plateau Research to form an international research programme on the Third Pole, http://www.tpe.ac.cn.) in 2009. Thus Indian efforts on establishing herself as a stakeholder by a leadership role in the Third Pole also have not been propagated adequately. In 2019 Arctic Circle assembly, Yao Tandong of the Institute of Tibetan Plateau Research, Chinese Academy of Sciences gave a presentation in which he termed the Tibetan Plateau as the Third Pole/ High Pole in contrast to India's position of the Himalayas being the Third Pole.

From the view of a non-science prism, the scientific progress and research by India appears to be sufficient in quantity but lacking in quality. In any case, India has been notorious for falling to the tactics of predatory journals with a view to have a sufficiently large quantity of publications with scant focus on the quality of the output. According to 2015 estimates, more than 8,000 predatory journals churn out more than 400,000 items a year, and India -- which has also seen a spurt in high-quality scientific publications -- contributes more than one-third of the articles in predatory publications. (Patwardhan, Bhushan. 2019). India's academic institutions of national importance are found to be ranked poorly on ARWU (Academic Ranking of World Universities) as well as SCImago Institutions Ranking World Reports. The governmental research organisations have also fared similarly, though the participation in international conferences, seminars and meetings is coloured with diplomatic and multilateral foreign policy hues rather than recognition of its scientific accomplishments.

There appear to be a severe disconnect between the professed scientific goals of Indian polar scientists and there is insufficient focus on academic culture for excellence in selected fields. The situation is adversely compounded by plethora of international conferences, meetings and events, most of which are organised in popular destinations taking away both time and resources. Scientific (mis)conduct is examined as a historical phenomenon borne of the interaction between individuals' aspirations and the systems that impose, measure, and reward scientific output in particular ways. (Shahare, 2020). It is assessed that the overwhelming influence of social milieu and bureaucratic practices on India's bodies like NCPOR is also not conducive to scientific excellence. The enhanced role of institutional practices, social structures, performance audits and inspections, and political direction can improve the situation to a considerable extent.

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